

FORM PTO-1390 (Modified) (REV 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 216458US2PCT	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR <div style="text-align: center; font-size: 1.2em; font-weight: bold;">09/926787</div>	
INTERNATIONAL APPLICATION NO. PCT/JP00/02607		INTERNATIONAL FILING DATE 20 APRIL 2000		PRIORITY DATE CLAIMED NONE	
TITLE OF INVENTION PORTABLE RADIO					
APPLICANT(S) FOR DO/EO/US Hideaki SHOJI, et al.					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
<ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below. 4. <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c) (2)) <ol style="list-style-type: none"> a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). b. <input checked="" type="checkbox"/> has been communicated by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)). 11. <input type="checkbox"/> A copy of the International Preliminary Examination Report (PCT/IPEA/409). 12. <input checked="" type="checkbox"/> A copy of the International Search Report (PCT/ISA/210). <p>Items 13 to 20 below concern document(s) or information included:</p> <ol style="list-style-type: none"> 13. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 14. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 15. <input type="checkbox"/> A FIRST preliminary amendment. 16. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 17. <input type="checkbox"/> A substitute specification. 18. <input type="checkbox"/> A change of power of attorney and/or address letter. 19. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825. 20. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 21. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). 22. <input type="checkbox"/> Certificate of Mailing by Express Mail 23. <input checked="" type="checkbox"/> Other items or information: <p style="margin-left: 40px;"> PCT/IB/308 PTO-1449 Drawings (4 sheets) </p>					

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/926787)		INTERNATIONAL APPLICATION NO. PCT/JP00/02607		ATTORNEY'S DOCKET NUMBER 216458US2PCT	
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24. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :				CALCULATIONS PTO USE ONLY	
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1040.00					
<input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$890.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	15 - 20 =	0	x \$18.00	\$0.00	
Independent claims	2 - 3 =	0	x \$84.00	\$0.00	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$890.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				\$0.00	
SUBTOTAL =				\$890.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$0.00	
TOTAL NATIONAL FEE =				\$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input checked="" type="checkbox"/>				\$40.00	
TOTAL FEES ENCLOSED =				\$930.00	
				Amount to be: refunded	\$
				charged	\$

a. ☒ A check in the amount of **\$930.00** to cover the above fees is enclosed.


b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **15-0030**. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING: Information on this form may become public. Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:



22850

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SIGNATURE

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24,913

REGISTRATION NUMBER

12-19-01

DATE

4/PRTS

09/926787
JC05 Rec'd PCT/PTO 19 DEC 2001

SPECIFICATION

Portable Radio

5 Technical Field

The present invention relates to portable radios or mobile radio sets and, more specifically to a portable radio provided with two types of antennae.

10 Background Art

One example of a portable radio provided with two types of antennae is disclosed in Japanese Utility Model Laying-Open No. 61-42148.

The portable radio disclosed in the aforementioned laid-open application includes a whip antenna capable of being freely pushed in or pulled out from a casing, and a small antenna contained in the casing. For remote communication, the whip antenna is pulled out from the casing and connected to a transmission/reception circuit for communication. For local communication, the whip antenna is contained in the casing, and the internal small antenna is connected to the transmission/reception circuit for communication.

However, the aforementioned document does not contain details such as the shapes of the internal small antenna and whip antenna. Thus, if these antennae are simply combined, a problem of inefficiency may arise due to antenna coupling.

25 Disclosure of the Invention

The present invention is made to solve the aforementioned problem. An object of the present invention is to alleviate the inefficiency problem due to antenna coupling in a portable radio or a mobile radio set provided with two types of antennae.

In one aspect, a portable radio or a mobile radio set of the present invention includes a casing, a first linear antenna capable of being pulled out from the casing, a second plate-like antenna contained in the casing

and connected to a ground substrate, and a power supply or feeding means for exciting at least one of the first and second antennae.

Having intensively studied to alleviate the inefficiency problem due to antenna coupling in a portable radio provided with two types of antennae, the present inventor has found that the combination of the first linear antenna and the second plate-like antenna connected to the ground substrate provides smaller antenna coupling, as shown in Fig. 7. As a result, the inefficiency due to inter-antenna interference can be alleviated.

The portable radio preferably includes a switching means between the first and second antennae, and the power supply means.

The above mentioned switching means may connect the first antenna and power supply means when the first antenna is pulled out, and connect the second antenna and power supply means when the first antenna is pushed in.

The switching means may connect both the first and second antennae to the power supply means when the first antenna is pulled out, and connect the second antenna to the power supply means when the first antenna is pushed in.

Further, the switching means may connect both the first and second antennae to the power supply means when the first antenna is pulled out, and also connect both the first and second antennae to the power supply means when the first antenna is pushed in.

Furthermore, the switching means may connect the first antenna to the power supply means when the first antenna is pulled out, and connect both the first and second antennae to the power supply means when the first antenna is pushed in.

The first antenna preferably includes a monopole antenna having a length which is an integral multiple of a half wavelength. The second antenna preferably includes a patch antenna. Further, the first antenna may include a helical antenna arranged in series with the monopole antenna.

It is preferred that the first antenna is inclined toward the side opposite a human body. In this way, the antenna performance becomes

less affected by the human body.

In another aspect, a portable radio of the present invention includes a casing having a flip, a first antenna provided in the flip, a second plate-like antenna contained in the casing and connected to the ground substrate, and a power supply means for exciting at least one of the first and second antennae.

The above combination of the first and second antennae also provides smaller antenna coupling as in the invention according to the above mentioned one aspect.

The above mentioned portable radio preferably includes a switching means between the first and second antennae and the power supply means.

The switching means may connect the first antenna to the power supply means when the flip is opened, and connect the second antenna to the power supply means when the flip is closed.

Further, the switching means may connect both the first and second antennae to the power supply means when the flip is opened, and connect the second antenna to the power supply means when the flip is closed.

Furthermore, the switching means may connect both the first and second antennae to the power supply means when the flip is opened, and connect the first and second antennae to the power supply means when the flip is closed.

Moreover, the switching means may connect the first antenna to the power supply means when the flip is opened, and connect both the first and second antennae to the power supply means when the flip is closed.

Brief Description of the Drawings

Fig. 1A is a diagram schematically showing a portable radio according to a first embodiment of the present invention.

Fig. 1B is a side view of the portable radio in Fig. 1A.

Fig. 1C is an equivalent circuit diagram of the portable radio in Fig. 1A.

Fig. 1D is an equivalent circuit diagram of the portable radio in Fig. 1A.

Fig. 1E is a side view of an internal antenna of the portable radio in Fig. 1A.

Fig. 2A is a diagram schematically showing a portable radio according to a second embodiment of the present invention.

5 Fig. 2B is a side view of the portable radio in Fig. 2A.

Figs. 3A and 3B are equivalent circuit diagrams of a portable radio according to a third embodiment of the present invention.

Figs. 4A and 4B are diagrams schematically showing a portable radio according to a fourth embodiment of the present invention.

10 Figs. 5A and 5B are diagrams schematically showing a portable radio according to a fifth embodiment of the present invention.

Figs. 6A and 6B are diagrams schematically showing a portable radio according to a sixth embodiment of the present invention.

15 Fig. 7 is a graph showing a measurement result of antenna coupling in the portable radio of the present invention.

Best Modes for Carrying Out the Invention

Now, the embodiments of the present invention will be described with reference to Figs. 1A to 7.

20 First embodiment

Figs. 1A to 1D show a portable radio or a mobile radio set 1 such as a portable radio telephone of the first embodiment of the present invention as well as modifications thereof. Fig. 1E is a side view of the internal antenna shown in Fig. 1A.

25 As shown in Fig. 1A, portable radio 1 includes a casing 2, a first antenna 3, a second antenna 4, a switch 5, and a power supply means 6.

As shown in Fig. 1E, casing 2 contains a ground substrate 13 on which second antenna 4 is mounted. First antenna is preferably a monopole antenna, which can be freely pulled out from and pushed in casing 2. A length L1 of first antenna 3 is an integral (at least 1) multiple of a half wavelength (λ). Thus, the current to casing 2 can be controlled when pulling out.

30 Second antenna 4 is contained in casing 2 and is preferably a short

patch antenna. Second antenna 4 is rectangular when viewed from above in Fig. 1A, having at one end 4a a short-circuit board 12, and is connected to substrate 13 through short-circuit board 12. In addition, second antenna 4 has a length L2 in the width direction of casing 2 of for example $\lambda/4$.

The present inventor has found that the combination of first linear antenna 3 and second plate-like antenna 4 connected to ground substrate 13 provides smaller antenna coupling (about -20dB to -30dB) in the applied band as shown in Fig. 7 although the antennae are maintained fairly close to each other despite a large wavelength. Thus, the inefficiency problem due to an interference between antennas can be alleviated.

Further, the above mentioned second plate-like antenna 4 provides a radiation field by the combination of currents flowing through a portion parallel to ground substrate 13 and short-circuit board 12. As a result, omnidirectionality is obtained in the plane including the direction normal to the substrate and the direction from short-circuit board 12 toward the power supply point side, when viewing the substrate from above as a rectangular shape.

Further, since second antenna 4 is laterally arranged as shown in Fig. 1A, second antenna 4 does not have directionality in the plane orthogonal to the longitudinal direction of the casing and polarized waves become orthogonal to the longitudinal direction of the casing. Thus, when mounted obliquely to the human body, the polarized waves become generally vertical to the ground, whereby polarized wave alignment with respect to the base station of the vertically polarized waves is improved.

On the other hand, second antenna 4 may be longitudinally arranged as shown in Fig. 1D. Thus, second antenna 4 has omnidirectionality in the plane including the longitudinal direction of the casing and the direction normal to the substrate, and the polarization plane becomes parallel to the longitudinal direction of the casing. As a result, when operating a terminal device while looking at a data display portion on the casing or the like, favorable polarized wave alignment is ensured with respect to the base station of the vertically polarized waves regardless of

the tilt angle.

Note that the short-circuit point of second antenna 4 as shown in Fig. 1D may be at any of the upper and lower portions. Further, the shape of second antenna 4 can be arbitrarily selected if it causes a desired electric field in the space between second antenna 4 and substrate 13. Moreover, a plate-like antenna such as a patch antenna can be employed as an internal antenna of the present invention.

Switch 5 can selectively connects first antenna 3 and second antenna 4 to power supply means 6 through contacts 11a and 11b. Thus, first antenna 3 and second antenna 4 are selectively excited.

More specifically, referring to Fig. 1C, first antenna 3 and power supply means 6 are connected when pulling out first antenna 3, and second antenna 4 and power supply means 6 are connected when pushing in first antenna 3. Thus, first antenna 3 is used for communication when it is pulled out, and second antenna is used for communication when first antenna 3 is pushed in.

As shown in Fig. 1B, first antenna 3 preferably extends in the direction away from human body 7. In this way, the performance degradation of the antenna due to the human body may be alleviated.

Second Embodiment

Now, referring to Figs. 2A and 2B, the second embodiment of the present invention will be described.

As shown in Fig. 2A, in the second embodiment, a flip 8 is provided in casing 2 capable of being freely opened and closed, and first antenna 3 is provided in flip 8. The other parts of the structure are the same as in the example shown in Fig. 1A.

As in the first embodiment, the present embodiment would provide smaller coupling of first and second antennae 3 and 4, whereby the inefficiency problem due to inter-antenna interference can be alleviated.

First antenna 3 is typically contained in flip 8. For providing first antenna 3 in flip 8, a method disclosed in Japanese Patent Laying-Open No. 8-186518 may be employed.

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Switch 5 connects power supply means 6 to first antenna 3 when flip 8 is opened, and connects power supply means 6 to second antenna 4 when flip 8 is closed. Thus, first antenna 3 is used for communication when flip 8 is opened, and second antenna 4 is used for communication when flip 8 is closed.

As shown in Fig. 2B, flip 8 preferably extends in the direction away from human body side 7 when flip 8 is opened. Thus, first antenna 3 is held away from the human body.

Third Embodiment

Now, referring to Figs. 3A and 3B, the third embodiment of the present invention will be described. Fig. 3A shows that first antenna 3 is excited, and Fig. 3B shows that second antenna 4 is excited.

As shown in Figs. 3A and 3B, in the third embodiment, switches 9 and 10 are provided. When first antenna 3 is pulled out, for example as shown in Fig. 3A, first antenna 3 is excited and second antenna 4 is connected to a load impedance Z_2 . Thus, the phase of waves reflected by second antenna 4 can be controlled, whereby beam deformation or efficiency decrease of first antenna 3 is suppressed.

When first antenna 3 is pushed in, for example as shown in Fig. 3B, second antenna 4 is excited and first antenna 3 is connected to load impedance Z_1 . In this case also, beam deformation or efficiency decrease of second antenna 3 is suppressed.

Note that the concept of the third embodiment is applicable to the portable radio shown in Figs. 2A and 2B. In this case, when flip 8 is opened, first antenna 3 is excited and second antenna 4 is connected to load impedance Z_2 . When flip 8 is closed, second antenna 4 is excited and first antenna 3 is connected to load impedance Z_1 .

Fourth Embodiment

Now, referring to Figs. 4A and 4B, the fourth embodiment of the present invention will be described.

As shown in Figs. 4A and 4B, in the fourth embodiment, first

antenna 3 has a monopole antenna 3a and a helical antenna 3b. Monopole antenna 3a and helical antenna 3b are arranged in series.

Thus, monopole antenna 3a is used when monopole antenna 3a is pulled out, and helical antenna 3b is used when monopole antenna 3a is pushed in.

The fourth embodiment produces the same effect as the first embodiment. Further, in the fourth embodiment, second antenna 4 is excited both when monopole antenna 3a is pulled out and pushed in. Accordingly, monopole antenna 3a and second antenna 4 are both excited when monopole antenna 3a is pulled out, and helical antenna 3b and second antenna 4 are both excited when monopole antenna 3a is pushed in.

In the antenna of the present invention, a power supply circuit for exciting two antennae 3 and 4 can be designed as separate from the antenna because of the small coupling of first and second antennae 3 and 4, whereby designing is facilitated. In addition, by simultaneously exciting first and second antennae 3 and 4, the polarized waves are freely changed.

Here, an excitation method when first and second antennae 3 and 4 are simultaneously excited will be described with reference to Fig. 4A. In Fig. 4A, a power for exciting first antenna 3 is defined as V, and that for exciting second antenna 4 is defined as H.

When a ratio of the above mentioned power levels V and H (V:H) is 1:0, vertically polarized waves can be generated. When V:H is 0.5:0.5, waves polarized by 45° can be generated. When V:H is 0:1, horizontally polarized waves can be generated. Thus, by controlling the ratio of power levels V and H, the polarized waves can be freely changed.

Note that the concept of the fourth embodiment is applicable to the portable radio shown in Figs. 2A and 2B. In this case, first and second antennae 3 and 4 are simultaneously excited both when opening and closing flip 8.

Fifth Embodiment

Now, referring to Figs. 5A and 5B, the fifth embodiment of the present invention will be described.

As shown in Figs. 5A and 5B, in the fifth embodiment, only first antenna 3 is excited when first antenna 3 is pulled out, and helical antenna 3b and second antenna 4 are both excited when first antenna 3 is pushed in.

According to the fifth embodiment, the same effect as in the first embodiment is produced and, when first and second antennae 3 and 4 are excited, the same effect as in the fourth embodiment is produced.

Note that the concept of the fifth embodiment is applicable to the portable radio shown in Figs. 2A and 2B. In this case, only first antenna 3 is excited when flip 8 is opened, and first and second antennae 3 and 4 are excited when flip 8 is closed.

Sixth Embodiment

Now, referring to Figs. 6A and 6B, the sixth embodiment of the present invention will be described.

As shown in Figs. 6A and 6B, in the sixth embodiment, first antenna 3 and second antenna 4 are both excited when first antenna 3 is pulled out, and only second antenna 4 is excited when first antenna 3 is pushed in.

According to the sixth embodiment, the same effect as in the first embodiment is produced and, when first and second antennae 3 and 4 are simultaneously excited, the same effect as in the fourth embodiment is produced.

Note that the concept of the sixth embodiment is applicable to the portable radio shown in Figs. 2A and 2B. In this case, first and second antennae 3 and 4 are excited when flip 8 is opened, and only second antenna 4 is excited when flip 8 is closed.

As in the foregoing, although the embodiments of the present invention have been described, the features of the embodiments can be combined where appropriate. Further, it should be understood that the embodiments herein disclosed is by way of illustration only and is not to be taken by way of limitation. The scope of the present invention is limited only by the terms of the appended claim and may include all variations in the scope equivalent in meaning to the claims.

Industrial Applicability

The present invention can be effectively applied to a portable radio provided with at least two types of antennae.

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CLAIMS

- 09926787-121501
1. A portable radio, comprising:
a casing (2);
5 a first linear antenna (3) capable of being pulled out from said casing (2);
a second plate-like antenna (4) contained in said casing (2) and connected to a ground substrate (13); and
power supply means (6) for exciting at least one of said first antenna (3) and said second antenna (4).
10
2. The portable radio according to claim 1, further comprising switching means (5) between said first antenna (3) and said second antenna (4), and said power supply means (6).
15
3. The portable radio according to claim 2, wherein said switching means (5) connects said first antenna (3) and said power supply means (6) when said first antenna (3) is pulled out, and connects said second antenna (4) and said power supply means (6) when said first antenna (3) is pushed in.
20
4. The portable radio according to claim 2, wherein said switching means (5) connects both said first antenna (3) and said second antenna (4) to said power supply means (6) when said first antenna (3) is pulled out, and connects said second antenna (4) and said power supply means (6) when said first antenna (3) is pushed in.
25
5. The portable radio according to claim 2, wherein said switching means (5) connects both said first antenna (3) and said second antenna (4) to said power supply means (6) when said first antenna (3) is pulled out, and also connects both said first antenna (3) and said second antenna (4) when said first antenna (3) is pushed in.
30

(4) and said power supply means (6) when said flip (8) is closed.

5 13. The portable radio according to claim 11, wherein said switching means (5) connects both said first antenna (3) and said second antenna (4) to said power supply means (6) when said flip (8) is opened, and connects said second antenna (4) and said power supply means (6) when said flip (8) is closed.

10 14. The portable radio according to claim 11, wherein said switching means (5) connects both said first antenna (3) and said second antenna (4) to said power supply means (6) when said flip (8) is opened, and also connects both said first antenna (3) and said second antenna (4) to said power supply means (6) when said flip (8) is closed.

15 15. The portable radio according to claim 11, wherein said switching means (5) connects said first antenna (3) and said power supply means (6) when said flip (8) is opened, and connects both said first antenna (3) and said second antenna (4) to said power supply means when said flip (8) is closed.

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FIG. 1A

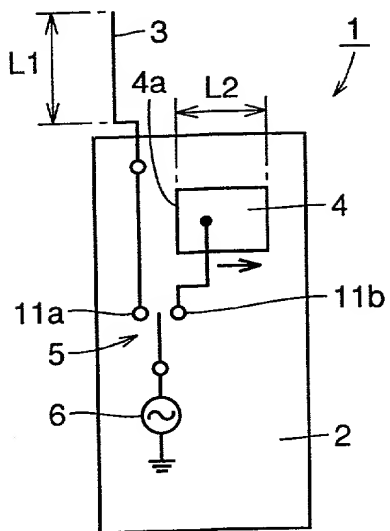


FIG. 1B

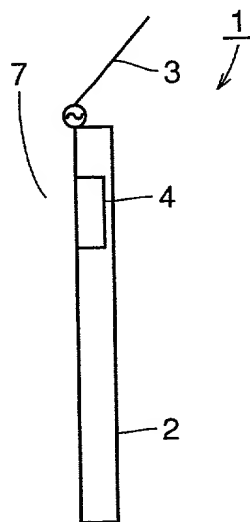


FIG. 1C

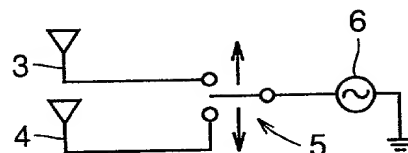


FIG. 1D

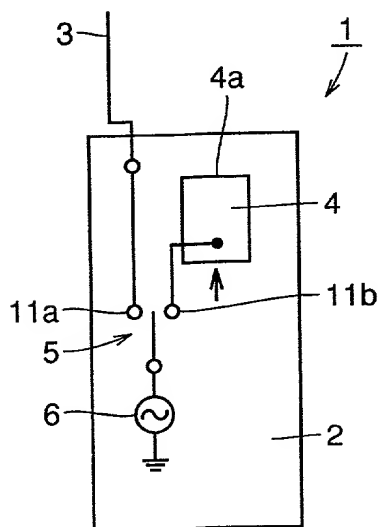
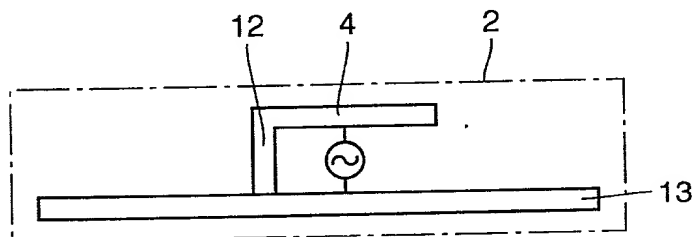


FIG. 1E



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FIG.2A

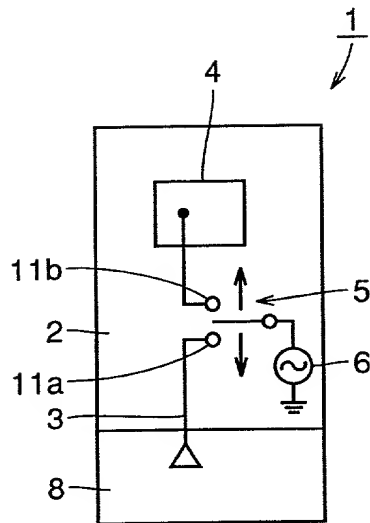


FIG.2B

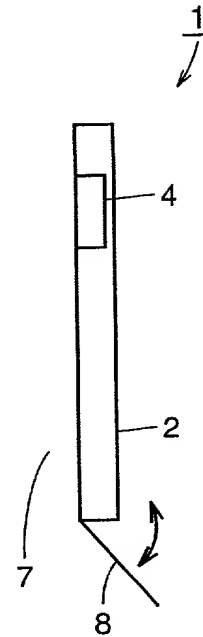


FIG.3A

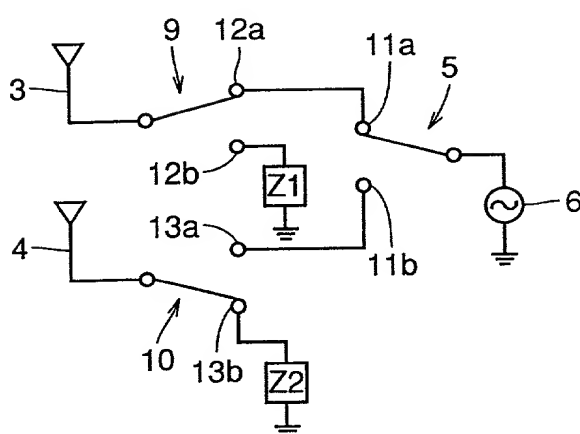
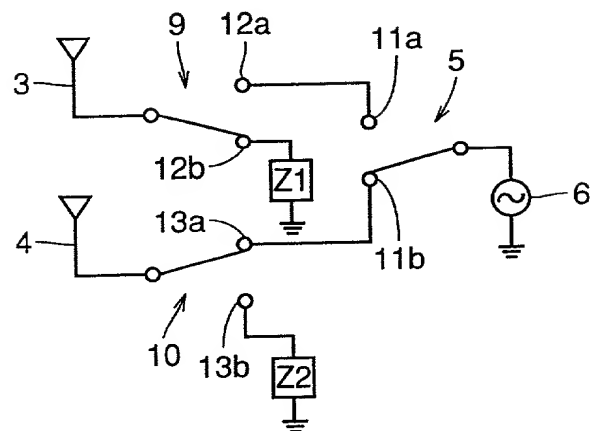


FIG.3B



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FIG.4A

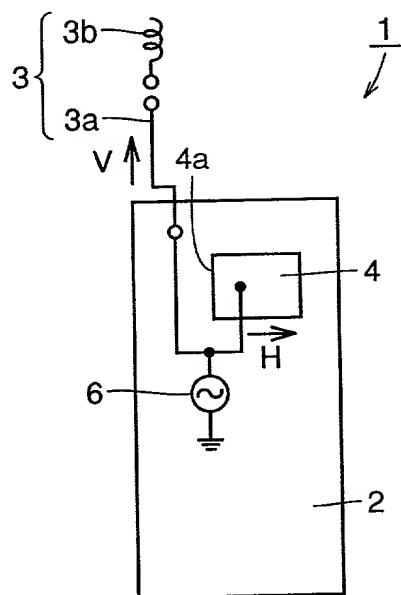


FIG.4B

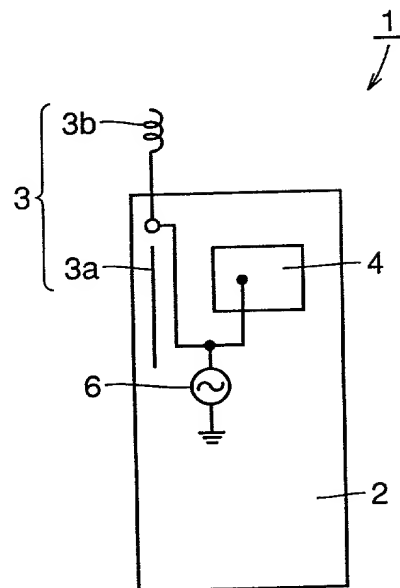


FIG.5A

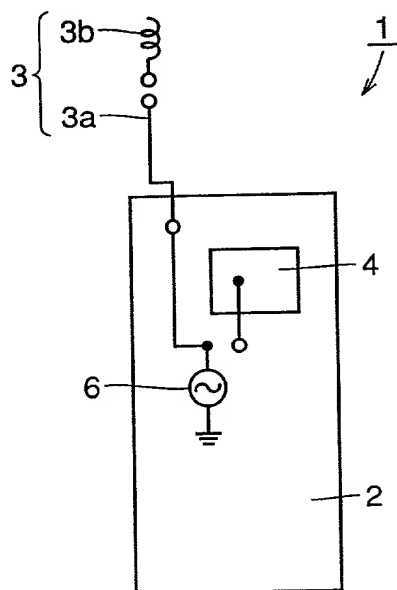


FIG.5B

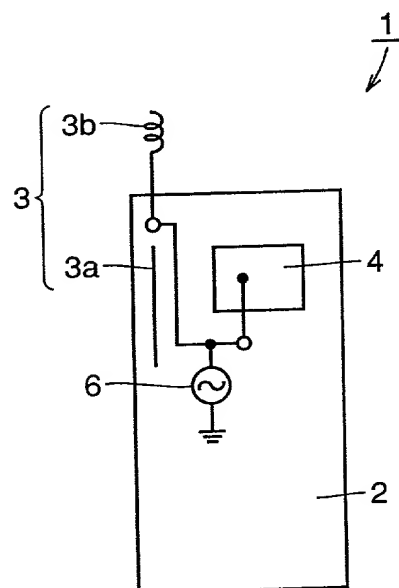


FIG.6A

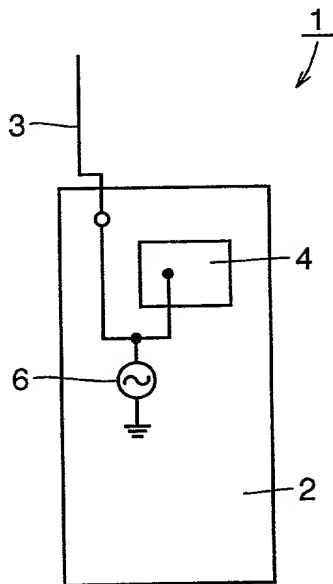


FIG.6B

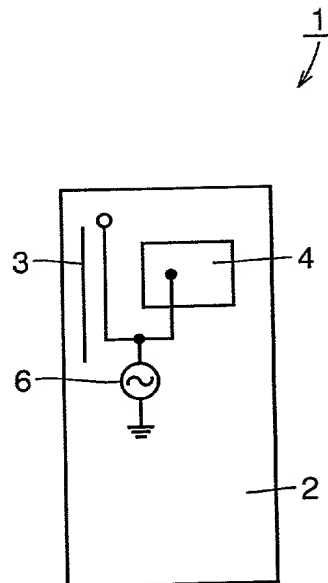
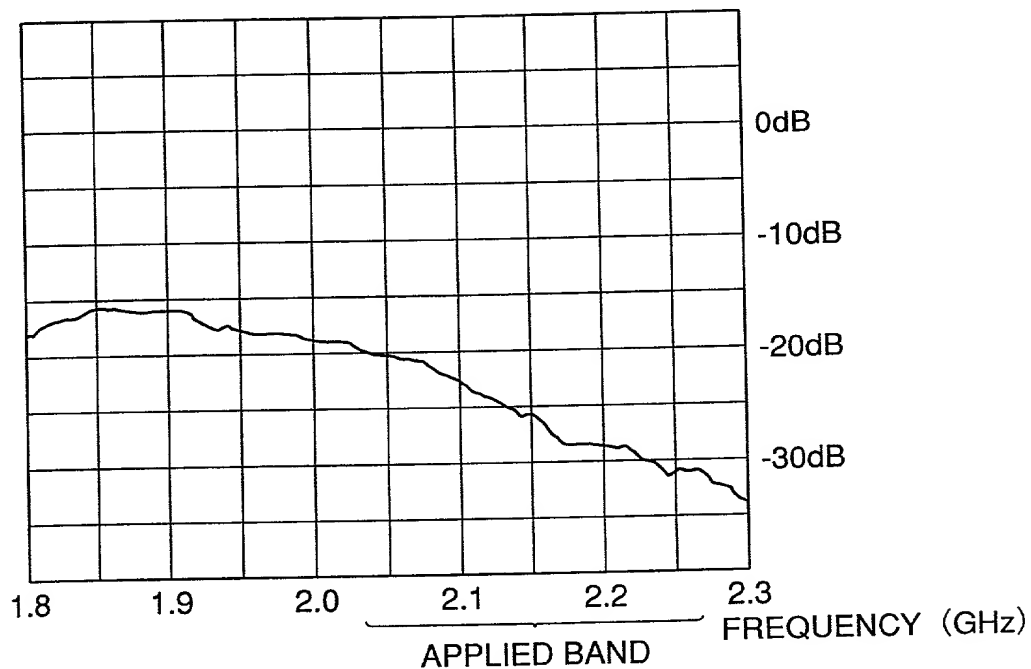


FIG.7



Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者（下記の名称が複数の場合）であると信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

PORTABLE RADIO ✓

上記発明の明細書は、

the specification of which

☐ 本書に添付されています。

☒ is attached hereto.

☐ ____月____日に提出され、米国出願番号または特許協定条約国際出願番号を____とし、
(該当する場合) ____に訂正されました。

☒ was filed on April 20, 2000 ✓
as United States Application Number or
PCT International Application Number
PCT/JP00/02607 and was amended on
____ (if applicable).

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration
(日本語宣言書)

私は、米国法典第35編119条 (a) - (d) 項又は365条 (b) 項に基づき下記の、米国外の国の少なくとも一カ国を指定している特許協力条約365 (a) 項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

Prior Foreign Application(s)
外国での先行出願

(Number) (番号)	(Country) (国名)
(Number) (番号)	(Country) (国名)

私は、第35編米国法典119条 (e) 項に基づいて下記の米国特許出願規定に記載された権利をここに主張いたします。

(Application No.) (出願番号)	(Filing Date) (出願日)
-----------------------------	------------------------

私は、下記の米国法典第35編120条に基づいて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約365条 (c) に基づく権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第35編112条第1項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内または特許協力条約国際提出日までの期間中に入手された、連邦規則法典第37編1条56項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

(Application No.) (出願番号)	(Filing Date) (出願日)
(Application No.) (出願番号)	(Filing Date) (出願日)

私は、私自信の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じるところに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Claimed
優先権主張

(Day/Month/Year Filed) (出願年月日)	<input type="checkbox"/> Yes はい	<input type="checkbox"/> No いいえ
(Day/Month/Year Filed) (出願年月日)	<input type="checkbox"/> Yes はい	<input type="checkbox"/> No いいえ

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)
-----------------------------	------------------------

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Status: Patented, Pending, Abandoned)
(現況: 特許許可済、係属中、放棄済)

(Status: Patented, Pending, Abandoned)
(現況: 特許許可済、係属中、放棄済)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration
(日本語宣言書)

委任状：私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。

（弁理士、または代理人の指名及び登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)



022850

書類送付先

Send Correspondence to:



022850

直接電話連絡先：（名前及び電話番号）

Direct Telephone Calls to: (name and telephone number)

(703) 413-3000

単独発明者または第一の共同発明者の氏名	Full name of sole or first joint inventor
発明者の署名	Inventor's signature
日付	Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post Office Address
第二の共同発明者の氏名	Full name of second joint inventor, if any
第二の共同発明者の署名	Second joint inventor's signature
日付	Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post Office Address

(第三以降の共同発明者についても同様に記載し、署名すること)

(Supply similar information and signature for third and subsequent joint inventors.)

Japanese Language Declaration
(日本語宣言書)

第三の共同発明者の氏名	Full name of third joint inventor, if any <u>Toru FUKASAWA</u>		
第三の共同発明者の署名	日付	Third joint Inventor's signature <u>Toru Fukasawa</u>	Date <u>2001-8-20</u>
住所	Residence <u>Hyogo, Japan JPX</u>		
国籍	Citizenship <u>Japanese</u> ✓		
郵便の宛先	Post Office Address <u>c/o Mitsubishi Denki Kabushiki Kaisha,</u> <u>2-3, Marunouchi 2-chome,</u> <u>Chiyoda-ku, TOKYO 100-8310 JAPAN</u>		

第四の共同発明者の氏名	Full name of fourth joint inventor, if any <u>Hirovuki OHMINE</u>		
第四の共同発明者の署名	日付	Fourth joint Inventor's signature <u>Hirovuki Ohmine</u>	Date <u>2001-8-20</u>
住所	Residence <u>Hyogo, Japan JPX</u>		
国籍	Citizenship <u>Japanese</u> ✓		
郵便の宛先	Post Office Address <u>c/o Mitsubishi Denki Kabushiki Kaisha,</u> <u>2-3, Marunouchi 2-chome,</u> <u>Chiyoda-ku, TOKYO 100-8310 JAPAN</u>		

第五の共同発明者の氏名	Full name of fifth joint inventor, if any		
第五の共同発明者の署名	日付	Fifth joint Inventor's signature	Date
住所	Residence		
国籍	Citizenship		
郵便の宛先	Post Office Address		

第六の共同発明者の氏名	Full name of sixth joint inventor, if any		
第六の共同発明者の署名	日付	Sixth joint Inventor's signature	Date
住所	Residence		
国籍	Citizenship		
郵便の宛先	Post Office Address		

(第六またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for third and subsequent joint inventors.)